

What is claimed is:

1. A method for manufacturing a ferroelectric random access memory (FeRAM) capacitor, the method comprising the
5 steps of:

a) preparing an active matrix obtained by a predetermined process, the active matrix including a semiconductor substrate, a transistor, a bit line, a first ILD, a second ILD and a storage node;

10 b) forming a first bottom electrode on the second ILD and the storage node;

c) forming a third ILD on exposed surfaces of the first bottom electrode and the second ILD;

15 d) planarizing the third ILD till a top face of the first bottom electrode is exposed;

e) forming a second bottom electrode on the top face of the bottom electrode;

f) forming conductive oxides on exposed sidewalls of the first bottom electrode by carrying out an oxidation process;

20 g) forming a dielectric layer on exposed surfaces of the first bottom electrode, the second bottom electrode and the third ILD; and

h) forming a top electrode on the dielectric layer.

25 2. The method as recited in claim 1, wherein the step d) is carried out by using a chemical mechanical polishing (CMP) method.

3. The method as recited in claim 1, wherein the step d) is carried out by using a blanket etch method.

4. The method as recited in claim 1, wherein the first bottom electrode uses iridium (Ir).

5. The method as recited in claim 1, wherein the second bottom electrode employs a material selected from the group consisting of platinum (Pt), iridium (Ir), iridium oxide (IrO_x), ruthenium (Ru), rhenium (Re), rhodium (Rh), tungsten (W), titanium (Ti) and a combination thereof.

6. The method as recited in claim 1, wherein the dielectric layer uses a ferroelectric material selected from the group consisting of strontium bismuth tantalate ($\text{SrBi}_2\text{Ta}_2\text{O}_9$, SBT), lanthanum (La)-modified bismuth titanate ($(\text{Bi},\text{La})_4\text{Ti}_3\text{O}_{12}$, BLT) and lead zirconium titanate ($(\text{Pb},\text{Zr})\text{TiO}_3$, PZT), neodymium (Nd)-modified bismuth titanate ($(\text{Bi},\text{Nd})_4\text{Ti}_3\text{O}_{12}$, BNdT) and vanadium (V)-modified bismuth titanate ($(\text{Bi},\text{V})_4\text{Ti}_3\text{O}_{12}$, BVT).

7. The method as recited in claim 6, wherein the ferroelectric material has a perovskite crystal structure.

8. The method as recited in claim 6, wherein the ferroelectric material has a layered perovskite crystal structure.

9. The method as recited in claim 1, wherein the top electrode employs a material selected from the group consisting of Pt, Ir, IrO_x, Ru, Re, Rh, W, Ti and a combination thereof.

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10. The method as recited in claim 1, wherein the oxidation process is carried out by using a plasma gas.

10 11. The method as recited in claim 10, wherein the oxidation process is carried out by using plasma gas selected from the group consisting of oxygen (O₂) gas, argon (Ar) gas, nitrogen (N₂) gas, chlorine (Cl) gas, fluorine (F) gas and a combination thereof at a temperature ranging from a room temperature to about 400 °C.

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12. The method as recited in claim 1, wherein the oxidation process is carried out through an annealing process in an ambient of a gas selected from the group consisting of O₂, N₂ and a combination thereof, at a temperature ranging
20 from about 200 °C to about 600 °C.